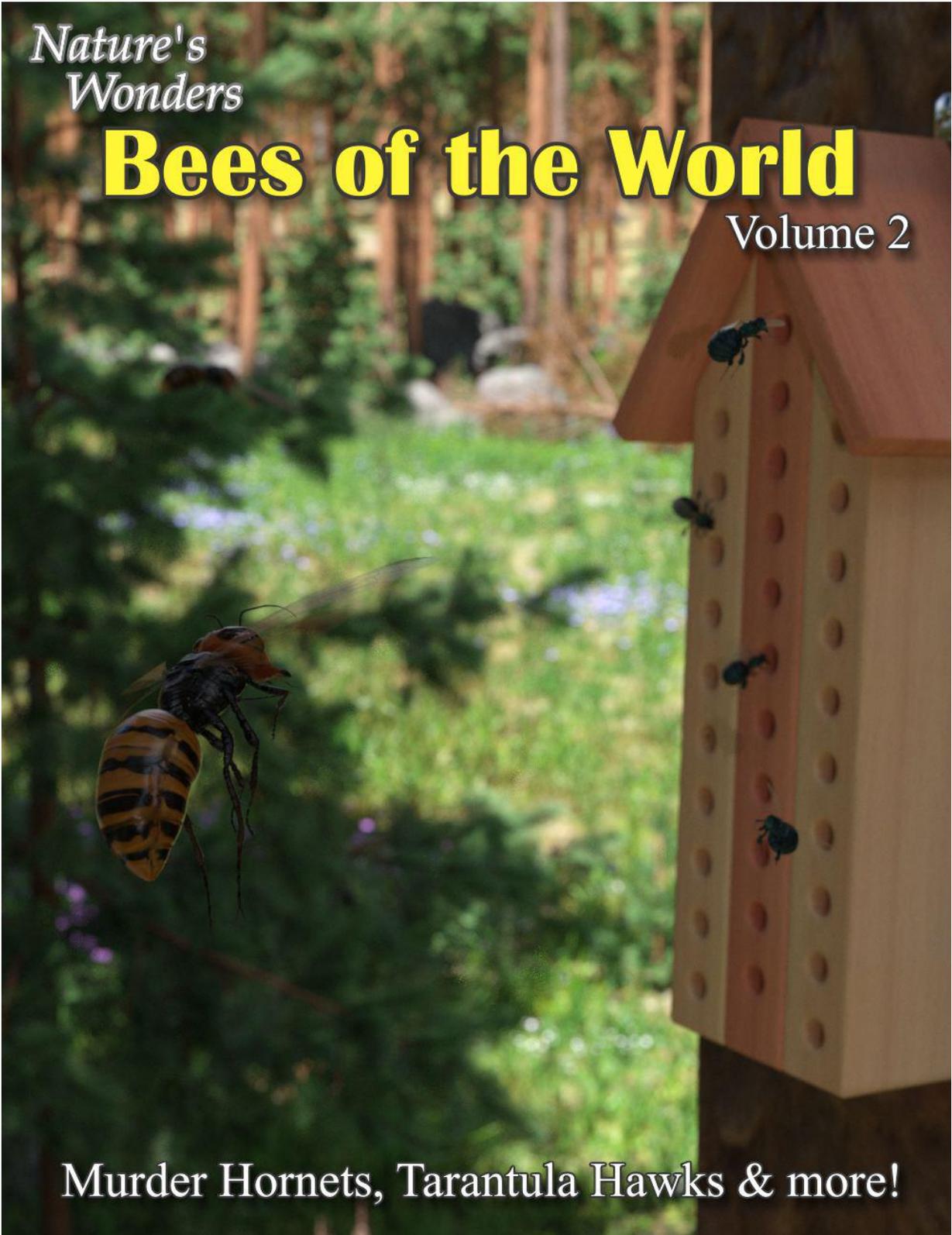


*Nature's  
Wonders*

# **Bees of the World**

Volume 2



Murder Hornets, Tarantula Hawks & more!

A 3D Model set by Ken Gilliland

## Nature's Wonders

# Bees of the World

## Volume 2

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# Nature's Wonders

# Bees of the World

## Volume 2

### Introduction

This volume is an add-on for the Nature's Wonders Bee Base set. It includes 6 species from the superfamily, *Apoidea*. In this second volume of "Bees of the World", an offering of bees and hornets found throughout the world including the infamous "Murder Hornet" and Tarantula Wasp. Also included is a mix of bumble and carpenter bees as well as the first domesticated bee, the Egyptian Honey Bee.

Bees of the World comes in both Poser and DAZ Studio native versions and support Firefly, 3Delight, Superfly and Iray render engines.

### Overview and Use

This set uses a common model to recreate digitally the *Apoidea* species included in this volume. Each species uses specific morphs from the generic model to single-out it's unique features. Select **Figures** in the Runtime Folder and go to the **Nature's Wonders Insects** folder:

- **Models Required to use this volume:**
  - **Natures Wonders Bee Base** - This model is sold separately at [Renderosity.com](http://Renderosity.com) and is **required** to use this product.

### Creating a Bee using Poser

1. For this example, we'll create a Tarantula Hawk.
2. Load Poser, select the FIGURES library and go to the Nature's Wonders Insects folder.
3. To create a Mud Dauber, Go to the Animals / Nature's Wonders / Fauna Libraries / Insects / **Bees of the World** folder and the Firefly or Superfly sub-folder. Select the Tarantula Hawk.

## Creating a Bee using DAZ Studio

1. For this example, we'll create a Tarantula Hawk.
2. Load DAZ Studio and go to the Animals / Nature's Wonders / Fauna Libraries / Insects / **Bees of the World** folder and select the sub-folder of which renderer you want to use, 3Delight or Iray. Select the Tarantula Hawk.

### The Insect Cam

All of the *Apoidea* species in this set have been scaled to their appropriate sizes in relation to human figure models. In most cases, these can be very small. With that in mind, this set comes with an "InsectCam".

The InsectCam is a camera set-up to focus on the default position of the insect. With Poser, it will also change the "hither" setting from its default value of 0.800 to 0.0 to allow close focus. The camera isn't a "perfect shot" type camera, it's a place to start getting your perfect shot.

### Sizing & Poser Issues

An issue that can appear when rendering in Poser, with only a bee (no other items) in the scene, is that it will produce a default square shadow. It is a known bug within Poser. To correct this issue, include a second larger item off-screen and the shadows will render correctly.

Poser's Superfly Renderer has trouble with overlaying transparency planes and can cause streaks and artifacts in the render. Using the "Physical Renderer Fix" morph and altering the hair morphs (in Creation Controls/Hair Controls) can help to minimize these issues. As a last resort, the "Hide Hair" controls turned to "1" (in Creation Controls/Hair Controls) remove the offending transparency planes and will resolve the issues.

### Posing the Bee Model

With most figure-based models the center of the model is the "hip" area. The thorax is considered the "hip" in this model.

**Nature's Wonders**

# **Bees of the World**

Volume 2

**Tarantula Hawk**

**Eastern Carpenter Bee**

**Asian Giant Hornet**

**Egyptian Honey Bee**

**Large Garden Bumblebee**

**Blue Orchard Bee**

# Tarantula Hawk

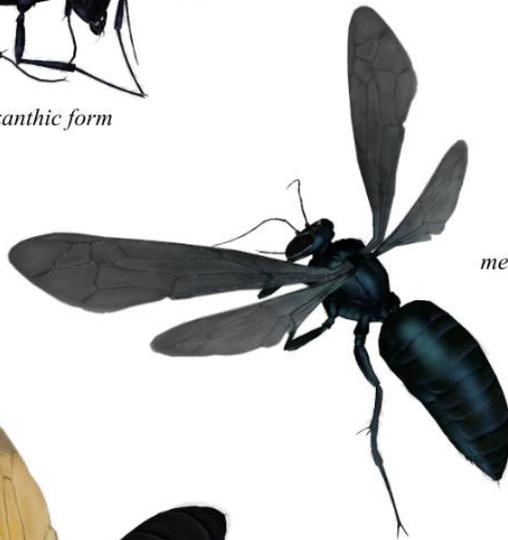
## *Pompilidae grossa*

**Range:** It is found from the southern United States of America as far north as Kansas, westward to California, and southward through Mexico and Central America to northern South America, including the Caribbean.

**Habitat and Ecology:** It is found in dry, arid areas-- anywhere where tarantula are found. These wasps are recorded as prey for other animals, with kingbirds (*Tyrannus species*) and the greater roadrunner (*Geococcyx californianus*) being recorded as preying upon them. The roadrunner beats the wasp against the ground before it eats it. Roadrunners have also been known to steal the spiders from the wasp (leaving the wasp unharmed). The American bullfrog (*Lithobates catesbeianus*) has also been recorded preying on these wasps.



*xanthic form*



*melanic form*



*lygamorphic form*

It preys on tarantula spiders, giving rise to the name. Only females hunt and seek prey in the late afternoon/twilight period of the day, avoiding the intense daytime sun. It flies low over the ground, detecting its prey using vision or scent. Entomologists believe it can detect the occupied burrows by the scent of the silk curtain the spider weaves over the entrance. It may also hunt on the ground, flicking its wings and antennae intensively.

Once a spider has been detected, the wasp uses its mandibles and carefully enters the spider's burrow. This causes the spider to leave the burrow where the wasp and it

can fight. Once the spider has been evicted, the wasp steps away from it and grooms itself before using its antennae to cause the spider to raise itself into a threat posture by raising its front legs and baring its fangs. The wasp then grabs the second legs and injects the spider with her sting between the base of the leg and the sternum, striking a nerve centre and causing paralysis in the spider. She may then feed on fluid exuding from the wound she has caused or she may groom herself again. The wasp may then drag the spider back into her burrow, or she may dig a new burrow, before laying a single egg on the spider and sealing the chamber. Fertilized eggs produce female wasps, unfertilized eggs produce male wasps.

The larva hatches from the egg and consumes the paralyzed spider, and when it is finished consuming the spider's vital organs, the larva weaves a silken cocoon for itself. It then metamorphoses into a pupa before emerging as an adult wasp.

They are capable of delivering a sting, which is considered the second most painful of any insect sting. The sting scores 4.0 out of 4.0 on the Schmidt sting pain index (the bullet ant only scores higher). The pain has been described as "putting your finger in an electrical socket your about five minutes". The venom is not very toxic with the lethality rating in mice being 65 mg/kg.

**Size:** Total Length: females 30-51 mm long; males 24-40 mm long.

**Description:** It has a black and orange color pattern and has a strong aposematic (warning) odor. It has three color forms are normally geographically separated. The *melanic* form occurs in the western part of the North American range and is blue-black in color with smokey wings. The *xanthic* form predominates over the remainder of the distribution, except that *lygamorphic* individuals which predominate in the southernmost part of the species range. The *xanthic* form has the iconic coloring; black with orange wings, while members of the *lygamorphic* form have a dark base to the wings which turns amber through the medium and tip.

Individuals of the *melanic* form of this species are difficult to separate from the Mexican Tarantula-hawk (*Pepsis mexicana*), which is smaller than it.

**Rarity and Status:** This species is not threatened.

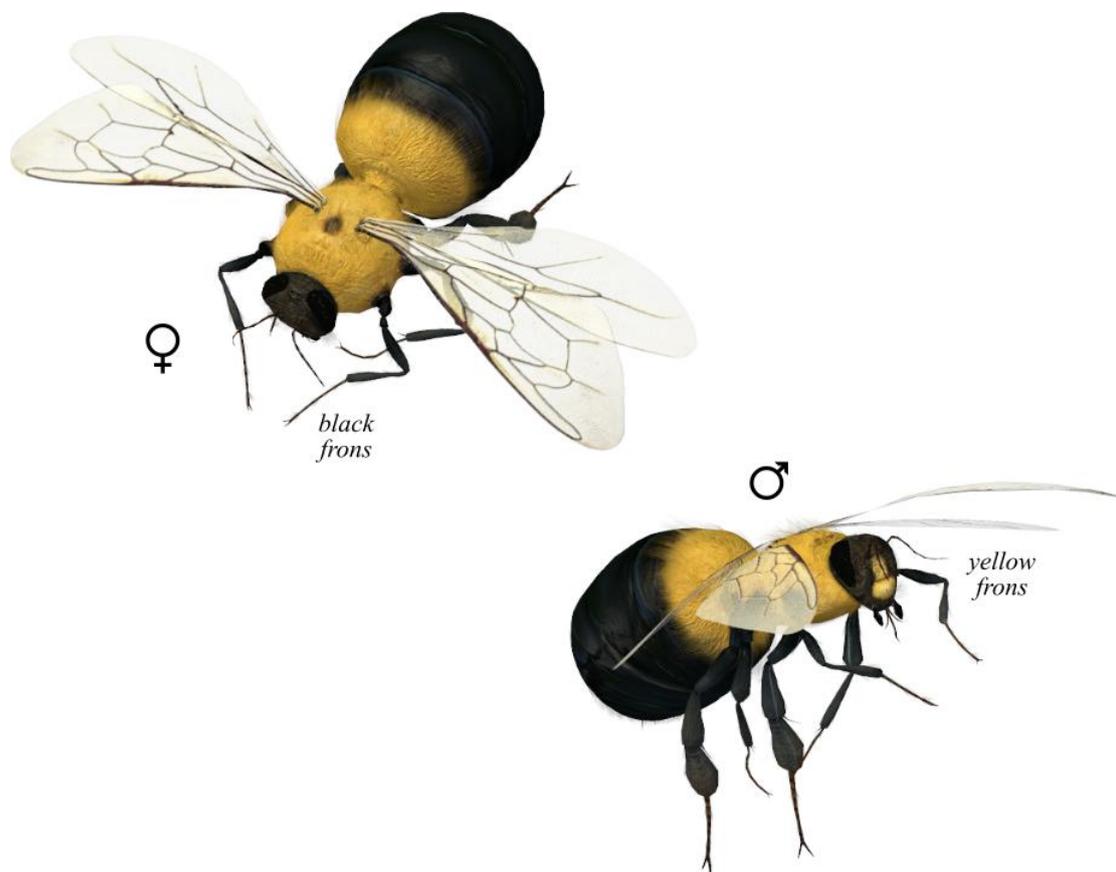
# Eastern Carpenter Bee

## *Xylocopa virginica*

**Range:** It is found throughout much of North America east of the Rocky Mountains and at least as far north as Nebraska, southern Ontario, and Maine.

**Habitat and Ecology:** They are found in forest and adjacent areas with flowering trees and plants.

They survive mostly on nectar and pollen. Newly emerged bees do not have food stored in their nest, but they are occasionally brought nectar. They often bite into the base of a flower to "rob" it (without pollinating it), however they can be good pollinators for blueberry crops.



They build their nests in wood, bamboo culms, agave stalks, and other comparable materials, but they prefer to nest in milled pine or cedar lumber. The nests are built by scraping wood shavings off of the wall. These shavings are then used to create partitions between nesting cells. The entrance cuts into the wood perpendicular to the grain, but they are built parallel beyond the entrance. These nests may be either social, containing groups of two to five females, or solitary. Social nests are more common, despite the fact that brood productivity is actually lower when females choose to nest together.

The nests are usually round and typically have one to four tunnels. They have multiple branches, with each adult female living and laying eggs in a separate

branch but females sharing one common entrance. Because the nests are costly to build, it is common for females to reuse old nests.

Only females can sting and can do it multiple times.

**Size:** Total Length: adults 19-23 mm long.

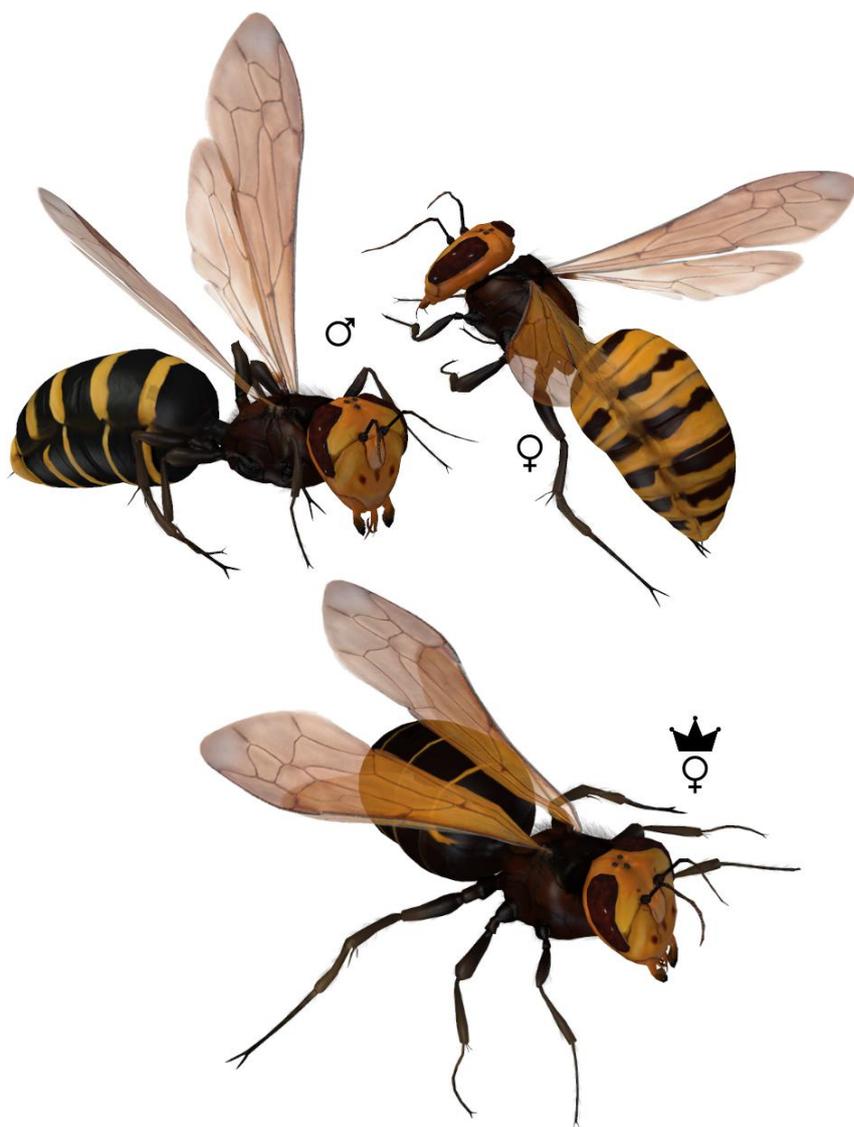
**Description:** It has a glossy, mostly black body with a slight metallic purple tint. The thorax is a hairy pale yellowish brown. Males and females have generally the same mass, but can be differentiated visually by the male's longer body and the female's wider head. The males also have a white spot on their face.

**Rarity and Status:** This species is not threatened.

# Asian Giant Hornet (aka Murder Hornet)

*Vespa mandarinia*

**Range:** It is native to temperate and tropical East Asia, South Asia, Mainland Southeast Asia, and parts of the Russian Far East. It was also found in the Pacific Northwest of North America in 2019 to 2021 (where it is considered an invasive species).



## Habitat and

**Ecology:** These hornets prefer to live in low mountains and forests, while almost completely avoiding plains and high-altitude climates. It creates nests by digging or co-opting pre-existing tunnels dug by rodents. It will occupy spaces near rotted pine roots. It feeds primarily on larger insects, colonies of other eusocial insects, tree sap, and honey from honey bee colonies.

It is the only species of social wasp known to apply a scent to direct its colony to a food source. The hornet secretes the chemical from the

sixth sternal gland, also known as the van der Vecht's gland. This behavior is observed during autumnal raids after the hornets begin hunting in groups instead of individually. The ability to apply scents may have arisen because the Asian giant hornet relies heavily on honey bee colonies as its main food source. A single hornet is unable to take on an entire colony of honey bees because species such as *Apis cerana* have a well-organized defense mechanism: the honey bees swarm one wasp and flutter their wings to heat up the hornet and raise carbon dioxide to a lethal level. So, organized attacks are much more effective and easily devastate a colony of tens of thousands of honey bees.

Its sting injects an especially potent venom, mandaratoxin. While a single wasp cannot inject a lethal dose, multiple stings can be lethal even to people who are not allergic if the dose is sufficient; but allergy to the venom greatly increases the risk of death. It has an LD50 of 4.0 mg/kg. Besides using their stingers to inject venom, Asian giant hornets are apparently able to spray venom into a person's eyes under certain circumstances.

In some Japanese mountain villages, the nests are excavated and the larvae are considered a delicacy when fried. In the central Chūbu region, these wasps are sometimes eaten as snacks or an ingredient in drinks. The grubs are often preserved in jars, pan-fried or steamed with rice to make a savory dish called hebo-gohan. The adults are fried on skewers, stinger and all, until the body becomes crunchy.

**Size:** Total Length: adults 45 mm long with a wingspan of 75 mm. Queens 50+ mm long

**Description:** Regardless of sex, the hornet's head is a light shade of orange and its antennae are brown with a yellow-orange base. Its eyes and ocelli are dark brown to black. It is distinguished from other hornets by its pronounced clypeus and large genae. Its orange mandible contains a black tooth that it uses for digging. The thorax is dark brown, with two gray wings. Its forelegs are brighter than the mid and hind legs. The base of the forelegs is darker than the rest. The abdomen alternates between bands of dark brown or black, and a yellow-orange hue (consistent with its head color). The sixth segment is yellow. Its stinger is typically 6 mm long and delivers a potent venom that, in cases of multiple hornets stinging simultaneously, can kill a human.

**Rarity and Status:** This species is not threatened and considered an invasive species outside of its normal range.

# Egyptian Honey Bee

*Apis mellifera lamarckii*

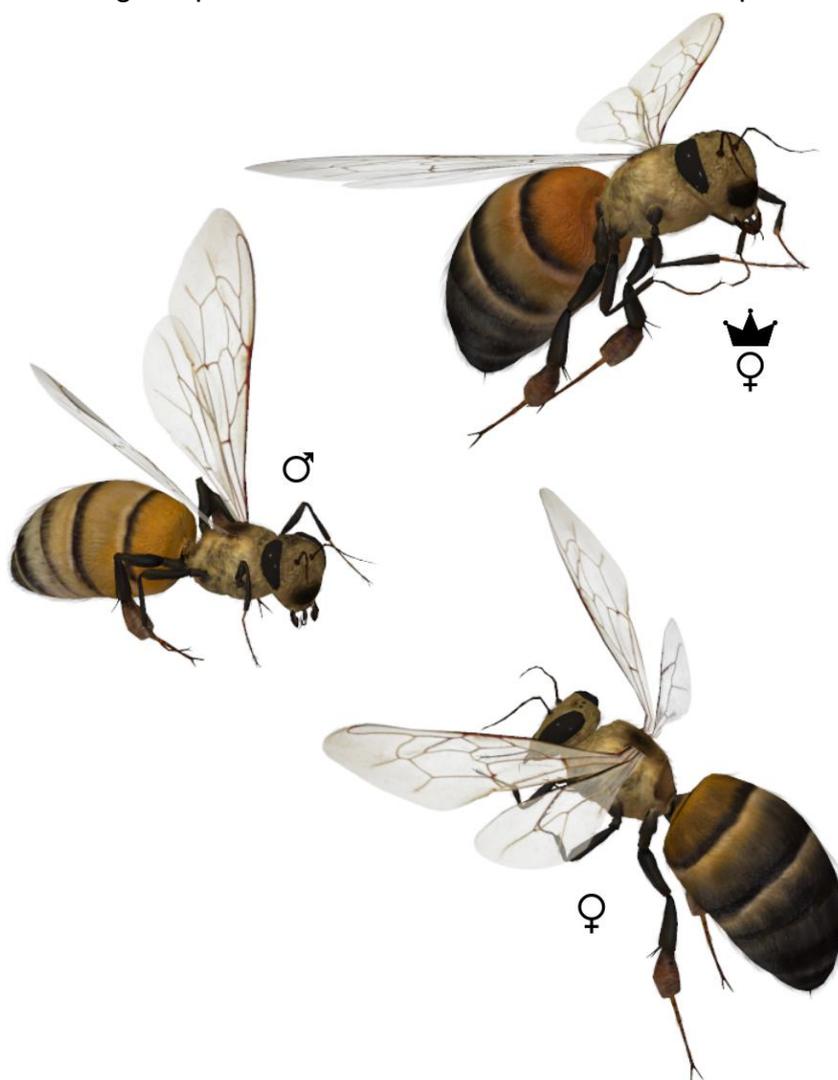
**Range:** It is native to the Nile valley of Egypt and Sudan.

**Habitat and Ecology:** The Egyptian honeybee's native habitat is restricted to the narrow Egyptian Nile valley. A unique trait of this bee is that it does not make bee glue (created with bee saliva and wax to seal unwanted spaces in the beehive). It also does not form winter clusters and does not overwinter in areas that experience freezing temperatures. It was named after Jean-Baptiste Lamarck. The mixes of some Egyptian Honey bee (Lamarck's) DNA can also be found in honey bees from California and in feral bees from Florida which rarely experience freezing weather.

**Size:** Total Length: worker adults 15 mm long, drones 17 mm long, queens 20 mm long.

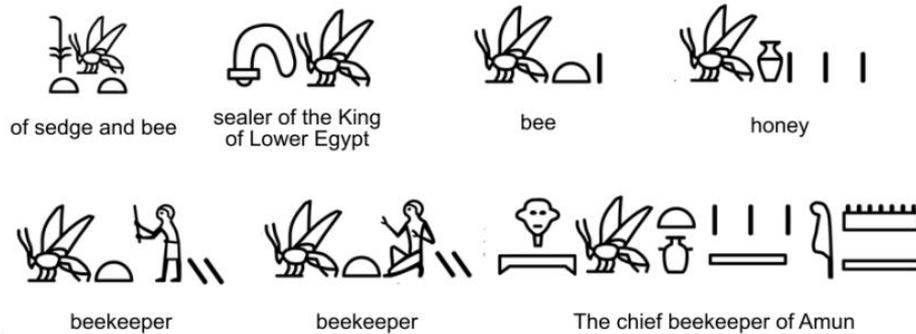
**Description:** It is a dark honey bee with silvery-white to pale yellow abdomen. It is one of the smaller subspecies. From drawings dated from 2600 BC, it is known that this was

the first bee managed by men, using a technique that is still practiced in Egypt today. It has a long history in apiculture, since colonies of this bee were shipped to Germany, England, and North America as early as the 1860s. In Berlin, an 'acclimatization association' was founded in 1864 with the special aim of importing bees from Egypt. The reason for this zeal in the apicultural world was the conspicuous color pattern of this bee.



. This bee only stings in defense. As honey bees go, this species is considered low in honey yield, but exhibiting good hygienic behavior.

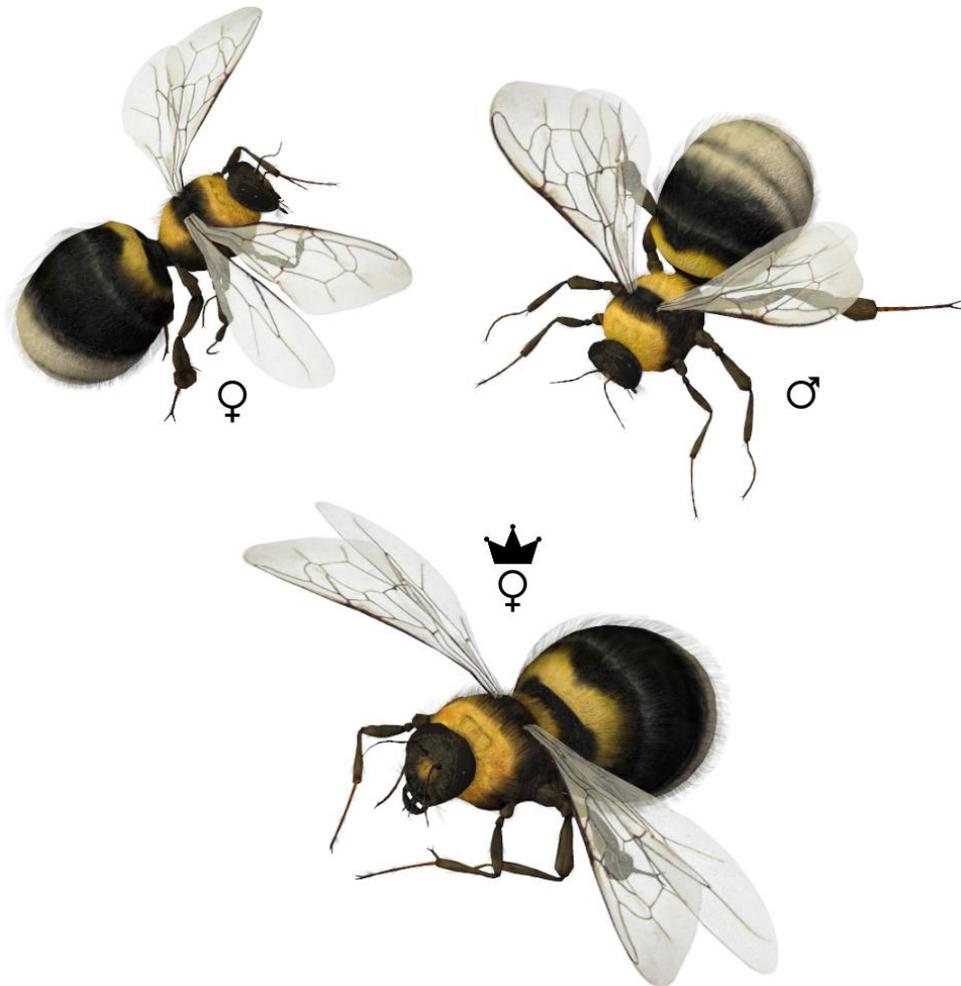
**Rarity and Status:** This species is vulnerable. It has been displaced in much of its native range through the deliberate importation and propagation of European subspecies. Of particular relevance has been the widespread promulgation of the Carniolan honeybee (*A. m. carnica*, native to Eastern Europe and the Balkans) in modern beekeeping equipment and the corresponding elimination of traditional mud-tube hives. Breeding programs utilizing Carniolan honeybees have produced a bee tolerant of Egyptian conditions, but susceptible to the parasitic mite, *Varroa destructor*. As a result, there has been widespread use of chemical pesticides in beehives. Recently, there has been increased interest in utilizing the native subspecies of Egypt, both for its adaptation to climatic conditions and the possibility that it, as other African subspecies, may be tolerant to parasitic mites. While about 96,000 colonies were counted in 1995, ten years later the population was reduced to just 15,500, mainly in the Assiut region of central Egypt.



# Large Garden Bumblebee

## *Bombus ruderatus*

**Range:** This is found in Europe and northern Africa, favoring large flower-rich areas of meadowland that support numerous species of plants with tubular-shaped flowers. It is vital that pollen and nectar sources are available within foraging distance of nests from April to September. Specifically in Europe, this species is present in Austria, Belgium, Great Britain, the Czech Republic, Denmark, France, Germany, Italy, Poland, Romania, Spain, and Switzerland. Since the 1800s, it has been used commercially in non-native countries to assist with crop pollination. In 1885, this species was introduced into New Zealand to pollinate the red clover plant, and in 1982, it was introduced into Chile for the same purpose. Since 1993, this species has also been seen in Argentina's Patagonia, thought to have traveled there through the low-altitude sections of the Andes.



**Habitat and Ecology:** Most nests for this species tend to be subterranean. They need moss and dried grass to be present in their habitats in order to successfully build their homes. Thus, they prefer grassland habitats with ample sunlight reaching the land in order to ensure secure and warm nests beneath

the ground. Queens have been seen to return to their maternal nest site, but will assess it indiscriminately to determine if it is suitable for colonization.

**Size:** Total Length: worker adults 13 mm long; drones 14 mm long and queens 18 mm long.

**Description:** The basic color of the body is black with two yellow bands on its mesonoma with one on its scutellum and one on its pronotum. There is a single thin yellow band on the abdomen. There is a black band located on the interwing and separates the two yellow bands on the thorax. It has a long face and tongue, which is well adapted for feeding on long-tubed flowers.

It is the largest bee in the UK.

**Rarity and Status:** This species is vulnerable. In many parts of the world, including western Europe and North America, have seen declining populations of their native bumblebees due to many contributing factors. In Britain specifically, habitat fragmentation has led to declines in this species, in both population size and pollination range. It is commonly found in sympatric distribution with the "Small Garden Bumblebee" (*B. hortorum*), but the latter has seemed to be unaffected by fragmentation, since it is still relatively common in Britain. Conversely, *B. ruderatus* has become one of the most rare of the 23 English bumblebees. Declines in bee populations can lead to other ecological issues, such as declines in the success of plant species that rely on their pollination.

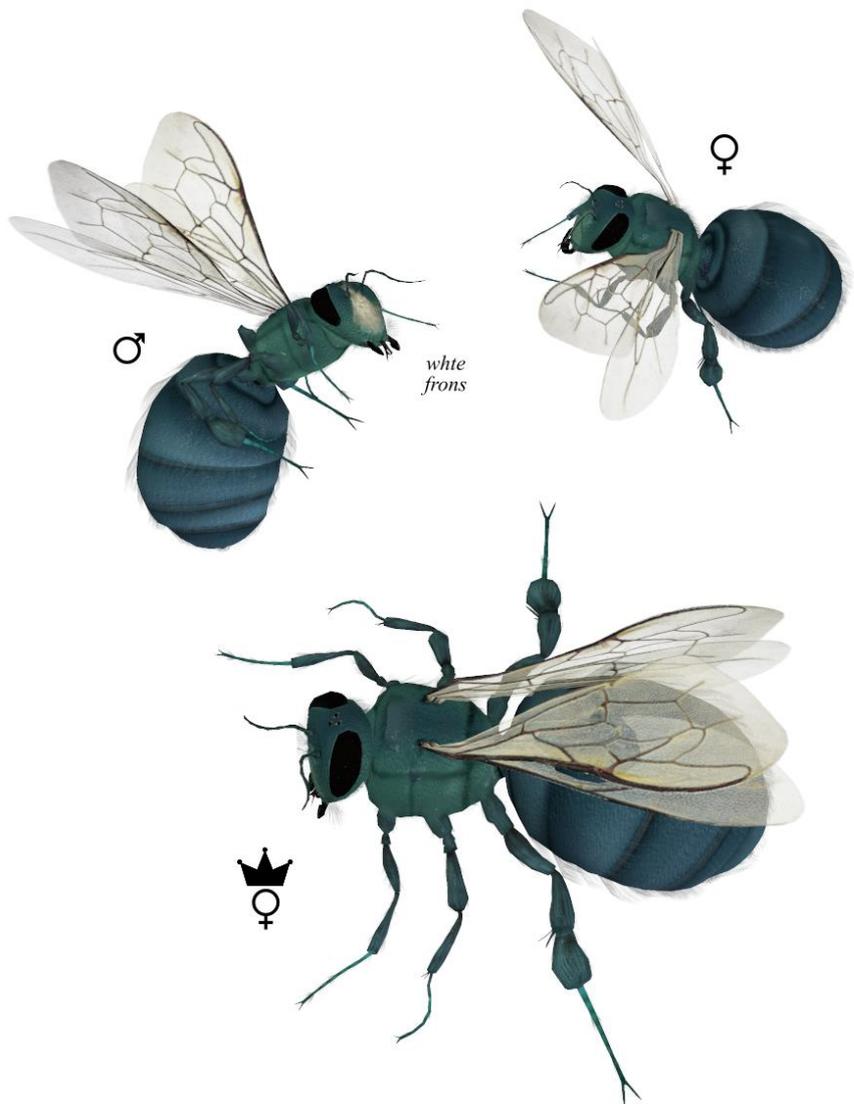
# Blue Orchard Bee

## *Osmia lignaria*

**Range:** It is found in the United States and Canada. Its species is divided by the Rocky Mountains into two subspecies, *O. l. propinqua* (western subspecies) and *O. l. lignaria* (eastern subspecies).

**Habitat and Ecology:** The bees begin to emerge from their cocoons in the spring when the daytime temperature reaches 14 °C (57 °F). The males emerge first. They remain near the nesting site and wait for the females to emerge, which can be several days to weeks depending on the number of days of warm weather. The first thing the females do is mate. A female typically mates once, or maybe twice. She is absent from the nesting site for several days while she feeds and waits for her ovaries to fully mature.

When a female is ready, she seeks out a suitable nest. They nest in narrow holes or tubes, though they have been found to nest inside cedar shakes and even keyholes. Beekeepers place prepared nesting materials to entice the females to stay close to the orchard or nearby forage. Good nesting material (reeds paper tubes, wood trays, or "bee condos") are as important as having the proper mud available (silty/clayey, as well as correct moisture content to grab/pack the mud). A female might inspect several potential nests before settling in. Once she has found a preferred nesting cavity, she flies outside of the hole and does an in-flight dance. She is orienting on major visual features to find her nest when she returns from foraging.



They arrange their nests as a series of partitions, with one egg per partition. A female begins the process by collecting mud and building the back wall, if necessary, of the first partition. She then makes several back-and-forth trips to nearby flowers. Unlike honey bees, which visit flowers that are miles away, females visit flowers nearest the nest. One bee can visit 75 flowers per trip, and it takes 25 trips to create a complete pollen/nectar provision. The female works tirelessly during the day, only stopping once the sun has gone down. When the sun rises the next morning, she basks in its rays until warm enough to fly, then continues foraging.

Once the pollen provision is large enough, she backs into the hole and lays an egg directly upon it. She then collects more mud to seal off the partition. The new wall also doubles as the back wall of the next cell, and she continues until she has filled the nest hole with a series of offspring. *O. lignaria* bees, like many insects, can select the gender of the egg they lay by fertilizing the egg, or not. Unfertilized eggs are males, while fertilized eggs are females. The adult bee lays female eggs in the back of the burrow, and the male eggs towards the front. On average, she lays about three males and one to two females per cavity. Because females are larger than males and require more pollen reserves, cavity dimensions can play a significant role in the cavity selection process.

When the egg hatches, the larva consumes the food provision and goes through many changes before becoming an adult. It will spend most of its life alone in this dark cell made by its mother.

Once the female has finished the nest, she plugs the entrance with a mud wall, thicker than the partitions that precede it. She then seeks another location for a new nest. She works tirelessly until she dies. An *O. lignaria* female lives for about four to eight weeks, and can fill an average of four six-inch tubes in her lifetime, with about eight eggs per tube. Her work includes nearly 60,000 blossom visits, and has attracted growers to propagate the insect for pollination purposes in fruit orchards.

The Blue Orchard Bee is an exceptional pollinator. Females are excellent pollinators of apple, pear, and cherry trees in the northwestern U.S. They are also efficient pollinators of fruiting bushes, such as blueberries, and have been shown to be successful at pollinating almonds. Due to their productive pollination habits, they have been imported into many areas of the country that are lacking sufficient numbers of native pollinators..

**Size:** Total Length: female and male adults 12.5mm long; Queen 16.4mm long.

**Description:** It is a dark metallic blue bee. They have a pale blue face that is covered with a mixture of white and black hair. The thorax has intermixed pale and black hair on the scutum and primarily black hair on the episternum. T1 and sometimes T2 are covered in white hair, and the remaining terga are covered with primarily black hair.

Orchard mason bees, like all mason bees, are very shy and only sting if they perceive serious danger. They do not attack to defend themselves. The stinger is actually an egg guide. Because of their docile behavior, mason bees are preferred by people who desire pollination in urban settings.

**Rarity and Status:** This species is not threatened.

## Special Thanks to:

.. to my beta testers, FlintHawk and Alisa

## Sources:

- Wikipedia (<https://www.wikipedia.org/>)
- Bees, Wasps & Ants Recording Society (<https://www.bwars.com>)
- Bee Careful (<http://www.bee-careful.com/bee-life/bee-community/>)
- US Forest Service (<https://www.fs.fed.us>)
- Bumblebee Conservation Trust (<https://www.bumblebeeconservation.org>)

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